Kurs
Datenbankgrundlagen und Modellierung

Sebastian Maneth, Universität Bremen

maneth@uni-bremen.de

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Tutorial 4: Last Queries and First FDs

Tutor: Marcel Westenberg

Last queries:

- how many actor names belong to more than one actor?
- how many actors have the name of another actor?

how many actor names belong to more than one actor?

- select count(*) from (select name, count(distinct personid) cnt from persons natural join actors2movies group by name having cnt > 1);

15401

how many actors have the name of another actor?

- select sum(cnt) from (select name, count(distinct personid) cnt from persons natural join actors2movies group by name having cnt > 1);

37159

Any ideas?

Functional Dependencies

- Consider a table T with three columns:
- sch(T) = (A,B,C)

- How many different functional dependencies exist for such a table T?

- a.) 8   b.) 27   c.) 49   d.) 64

- $(2^3 - 1) * (2^3 - 1) = 7 * 7 = 49$

a
b
c
ab
ac
bc
abc

7 nonempty subset
of { a, b, c}

Find the FDs

country	continent	calling_code
Swaziland	Africa	+268
Switzerland	Europe	+41
Malta	Europe	+356
Papua New Guinea	Oceania	+675

List **all** completely non-trivial FDs.

country —> calling_code
country, continent —> calling_code
calling_code —> country
calling_code, continent —> country

what are the candidate keys?
{ country, continent }
{ calling_code, continent }

Find the FDs

Consider the following relation

Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

a.) Find **all completetly non-trivial FDs** for this table.

Find the FDs

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— you must use **common sense** to figure out
   what is meant by this relation!

— you may need to make some **assumptions**!

Find the FDs

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— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Then, what FD do we obtain from this?

ShipName —> ShipType
TripID —> ShipName, Cargo

Find the FDs

Consider the following relation

Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

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E.g. let us assume that *ShipNames* are unique.
Then, what FD do we obtain from this?

ShipName —> Shiptype

Find the FDs

Consider the following relation

Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

a.) Find **all completetly non-trivial FDs** for this table.

— you must use **common sense** to figure out
   what is meant by this relation!

— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.

TripId —> ???

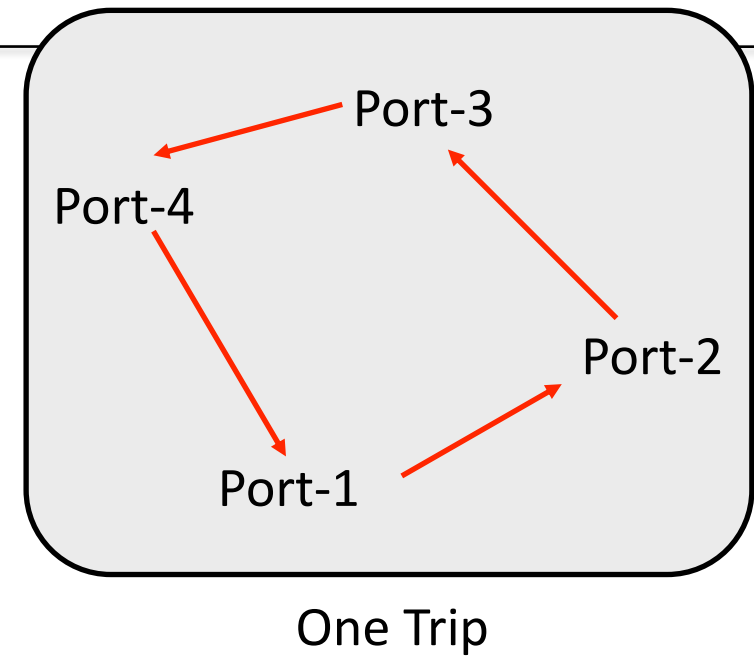# Find the FDs

Consider the following relation
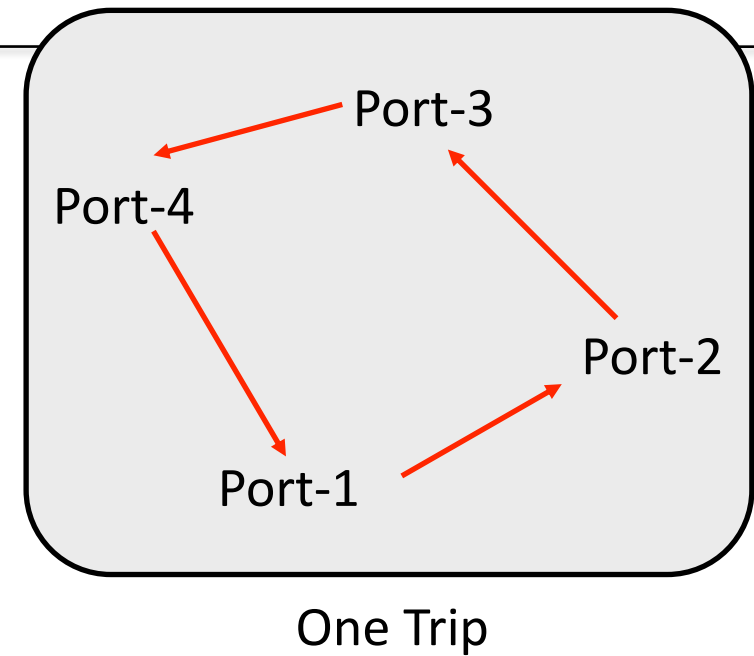
Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

a.) Find **all completetly non-trivial FDs** for this table.

─ you must use **common sense** to figure out
     what is meant by this relation!

─ you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Assume that *Cargo* does **not** change during one trip.

TripId —> ???

One Trip

Find the FDs

Consider the following relation
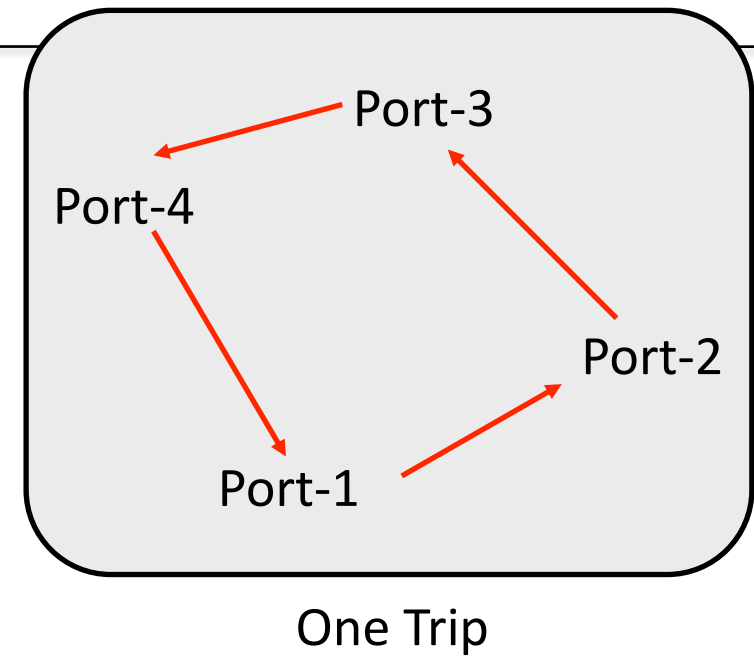
Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

a.) Find **all completetly non-trivial FDs** for this table.

— you must use **common sense** to figure out
     what is meant by this relation!

— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Assume that *Cargo* does **not** change during one trip.

TripId —> ???

One Trip

Find the FDs

Consider the following relation

Shipping(*ShipName*, *ShipType*, *TripId*, *Cargo*, *Port*, *Date*)

a.) Find **all completetly non-trivial FDs** for this table.

— you must use **common sense** to figure out
  what is meant by this relation!

— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Assume that *Cargo* does **not** change during one trip.

ShipName, Date —> ???

One Trip

Find the FDs

Consider the following relation

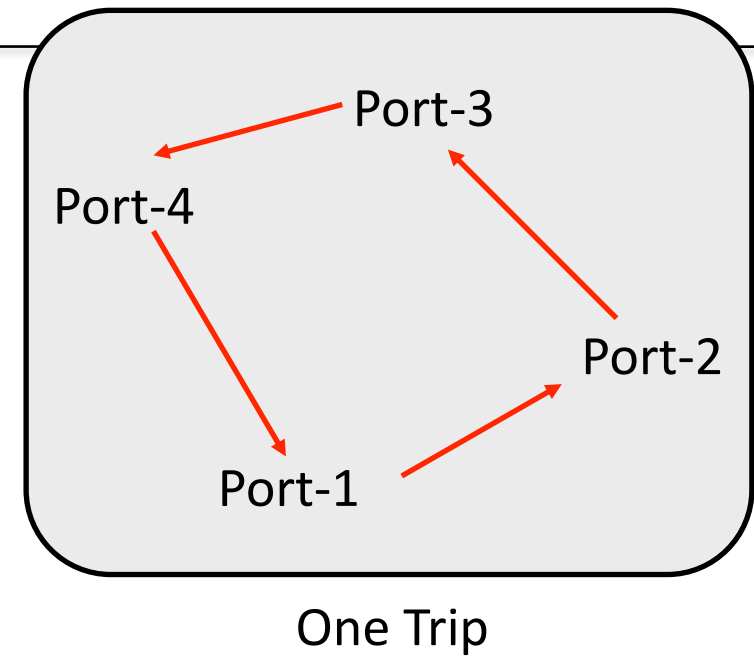**Shipping**(*ShipName, ShipType, TripId, Cargo, Port, Date*)

a.) Find **all completetly non-trivial FDs** for this table.

— you must use **common sense** to figure out
    what is meant by this relation!

— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Assume that *Cargo* does **not** change during one trip.

ShipName, Date —> ???

Assume this is a *DateTime* (i.e., includes hour/minutes/seconds)

One Trip

Find the FDs

Consider the following relation

Shipping(*ShipName, ShipType, TripId, Cargo, Port, Date*)

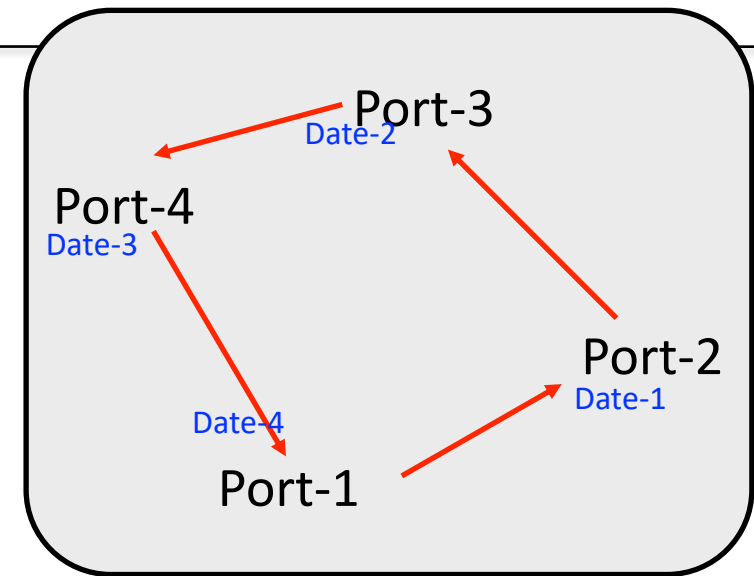a.) Find **all completetly non-trivial FDs** for this table.

— you must use **common sense** to figure out
   what is meant by this relation!

— you may need to make some **assumptions**!

E.g. let us assume that *ShipNames* are unique.
Assume that *Cargo* does **not** change during one trip.

ShipName, Date —> *???*

E.g. this *Datetime* is the arrival time at a given *Port*.

One Trip

Attribute Closure

$A \rightarrow B$

$B \rightarrow C$

$C \rightarrow D$

i. What is the closure of $\{A\}$? A ==> AB ==> ABC ==> ABCD
(1.)   (2.)   (3.)

ii. What is the closure of $\{B\}$? B ==> BC ==> BCD
(2.)   (3.)

iii. What is the closure of $\{D\}$? D

Attribute Closure

$A \rightarrow B$

$C \rightarrow D$

$E \rightarrow D$

$F \rightarrow A, E$

i. What is the closure of $\{A\}$? AB

ii. What is the closure of $\{A, B\}$? AB

iii. What is the closure of $\{A, C\}$? ABCD

iv. What is the closure of $\{F, D\}$? { A, B, D, E, F }

v. What are the candidate keys?

FC ==> AEFC ==> ABCEF ==> ABCDEF

Attribute Closure

$$A \rightarrow B, C$$
$$B \rightarrow D, E$$
$$C \rightarrow F, G$$
$$D, G \rightarrow H$$
$$E, F \rightarrow I$$
$$H, I \rightarrow A$$

i. What is the closure of $\{B\}$? B ==> BDE

ii. What is the closure of $\{B, G\}$? BG ==> BDEG ==> BDEGH

iii. What is the closure of $\{C, D, E\}$? CDE ==> CDEFG ==> CDEFGH ==>
CDEFGHI ==> ACDEFGHI
==> ABCDEFGHI

{ C, D, E }
{ A }

iv. What are the candidate keys?   { H, I }
{ B, C}   { E, F, H }
{B, G, F}
{ D, G, I }

General Form of an SQL Query:

```
SELECT     list of attributes
FROM       list of tables
WHERE      condition over attributes
GROUP BY   list of attributes
HAVING     condition over aggregates
ORDER BY   list of attributes
LIMIT      number
```

aggregate functions:

```
COUNT      VARIANCE
SUM        STDDEV
AVG        BIT_OR
MAX        BIT_AND
MIN
```